



# Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

June 3, 2014

SUBJECT: FAP Routes 587 & 573 (US 34 & US 30)  
Project ACHSIP-000S(989)  
Section (19, 20)RS-5 & I-1/(116)RS-4 & I-1  
DeKalb & LaSalle Counties  
Contract No. 66D85  
Item No. 91, June 13, 2014 Letting  
Addendum A

## NOTICE TO PROSPECTIVE BIDDERS:

Attached is an addendum to the plans or proposal. This addendum involves revised and/or added material.

1. Revised pages 4-12 of the Special Provisions

Prime contractors must utilize the enclosed material when preparing their bid and must include any Schedule of Prices changes in their bidding proposal.

Bidders using computer-generated bids are cautioned to reflect any and all Schedule of Prices changes, if involved, into their computer programs.

Very truly yours,

John D. Baranzelli, P.E.  
Acting Engineer of Design and Environment

A handwritten signature in black ink, appearing to read "Ted B. Walschleger P.E." with a stylized flourish at the end.

By: Ted B. Walschleger, P. E.  
Engineer of Project Management

cc: Paul A. Loete, Region 2, District 3; Laura Mlacnik, Tim Kell; Estimates

MS/kf

**SPECIAL PROVISION FOR HIGH FRICTION SURFACE TREATMENT (BMPR/BSE)**

Effective: January 1, 2014

Revised: June 3, 2014

Description. This work shall consist of constructing an experimental High Friction Surface Treatment (HFST) on a hot-mix asphalt (HMA) or portland cement concrete (PCC) pavement surface to restore or enhance the skid resistance. The HFST shall be composed of calcined bauxite aggregate bound with a polymeric resin.

Materials. Materials shall be according to the following requirements.

- (a) General. The Contractor shall provide certification for both the polymeric resin binder and aggregate that states the materials meet the requirements listed in Tables 1 and 2, respectively, at least 60 days prior to construction. Laboratory testing for third party certification shall be performed by an accredited laboratory for properties identified in Tables 1 and 2. The aggregate certification shall reflect that testing was performed within 12 months of the project letting date.

Independent assurance samples of the polymeric resin binder (0.125 gal (0.5 L) of each component) and aggregate (two 40-lb (18-kg) bags) shall be submitted to the Bureau of Materials and Physical Research 60 days prior to construction.

Materials shall be stored in a clean, dry environment and in accordance to the manufacturer's recommendations.

Material Safety Data Sheet (MSDS), Product Data Sheet, and other information pertaining to the safe practices for the storage, handling, and disposal of the materials, and to their health hazards shall be obtained from the manufacturer and posted at storage areas. A copy of such information shall be provided to the Engineer.

- (b) Polymeric Resin Binder. The polymeric resin binder shall consist of a two part thermosetting polymer resin compound which holds the aggregate firmly in position, and conforms to the requirements of Table 1. The polymeric resin shall be on the Department's current "Approved List for High Friction Surface Treatment – Part A". The polymeric resin manufacturer shall ensure that the material is suitable for temperatures that will be experienced at the time of placement.

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Table 1 – Polymeric Resin Binder Material Properties Requirements

Property	Test Method	Requirements
Viscosity, Poises	ASTM D 2556	7 - 30
Ultimate Tensile Strength, psi	AASHTO M 235	2,500 - 5,000
Compressive Strength, psi	ASTM C 579	1,000 min. (3 hours) 5,000 min. (7 days)
Gel Time, minutes	AASHTO M 235	10 min.
Water Absorption, %	AASHTO M 235	1 max.
Durometer Hardness (Shore D)	ASTM D 2240	60 - 80
Cure Rate (Dry through time), hours	ASTM D 1640, 55 mil wet thickness @ 75 °F	3 max.
Elongation at Break Point, %	AASHTO M 235	30 - 70
Mixing Ratio	Provide manufacturer's recommendations a minimum of 60 days prior to construction.	Per Manufacturer
Adhesion Strength, psi @ 24 hrs	ASTM D 4541	250 min. or 100% substrate failure
Infrared Spectrum	AASHTO T 237	Note 1

Note 1: To be established by each manufacturer for each individual component and combination of components.

- (c) Aggregate. The aggregate shall be calcined bauxite that is clean, dry, free from foreign matter, and conforms to the requirements in Table 2. The aggregate shall be on the Department's current "Approved List for High Friction Surface Treatment – Part B". Deliver the calcined bauxite to the construction site in clearly labeled super sacks weighing at least 2,200 lb (1,000 kg). When hand applications are necessary, 55 lb (25 kg) bags of material may be substituted.

Table 2 – Aggregate Material Properties Requirements

Property	Test Method	Requirements
Gradation		
<u>Sieve Designation</u>		<u>Percent Passing (min.)</u>
No. 4 (4.75 mm)	AASHTO T 27	100
No. 6 (3.35 mm)		95.0-100.0
No. 16 (1.18 mm)		0.0-5.0
Moisture Content, %	AASHTO T 255	0.2 max.
Aluminum Oxide, %	ASTM C 25	87 min.
LA Abrasion Test, %	AASHTO T 96, (D grading)	20 max.

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Equipment. Equipment shall be according to the following.

- (a) Truck Mounted Application Machine. The HFST application machine shall be an approved self-propelled, fully automated truck mounted application machine capable of continuously applying resin and aggregate at a uniform thickness and rate, respectively, in varying widths of up to 12 ft (3.6 m).

The application machine shall be capable of continuously and thoroughly mixing polymeric resin binder components to the ratio recommended by the polymeric resin manufacturer. The polymeric resin shall be uniformly applied to the pavement surface at a minimum coverage rate of 10 gal/min (38 L/min) with a minimum uniform application thickness of 50 mils (1.25 mm).

The aggregate shall be applied by the same application machine which includes an aggregate drop spreader capable of mechanically continuously spreading bauxite aggregate at a minimum rate of 11 lb/sq yd (6 kg/sq m), with a minimum height from spreader to pavement surface of 12 in. (300 mm) to achieve proper spread of aggregate. The use of chip spreaders, vehicle tires, rollers, vibratory compactors or devices that throw loose aggregate onto any part of the live roadway lanes will not be allowed to apply the aggregate onto the wet uncured resin.

The HFST application machine shall be capable of the uniform application of the binder and aggregate at a minimum continuous application rate of 2,300 sq yd/hour (1,925 sq m/hour).

- (b) Portable Shot Blast Equipment. The portable shot blast equipment shall meet the requirements of Article 1101.13.
- (c) Regenerative Air Sweeper (RAS). The Regenerative Air Sweeper (RAS) shall be self-propelled with power brooms capable of cleaning the existing pavement and removing loose aggregate without dislodging the bonded HFST aggregate. The vacuum head shall have a minimum width of 6 ft (2 m) and blast re-circulated, filtered air at a minimum rate of 20,000 cu ft/min (565 cu m/min). The RAS shall be capable of recycling loose aggregate into clean, uncontaminated, and dry aggregate. The RAS shall be capable of being used without water for dust suppression to ensure a dry surface will be maintained.

### CONSTRUCTION REQUIREMENTS.

Qualifications. The Contractor that is placing the HFST shall have the truck mounted application machine as described in Paragraph (a) under Equipment and shall provide documentation showing HFST or equivalent experience on at least three projects with similar state highway agencies.

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Quality Control (QC) Plan. Submit a QC Plan to the District Materials Engineer for approval at least 60 days prior to the placement. The QC Plan shall show proposed methods to control the equipment, materials, mixing, and paving operations to ensure conformance with these Specifications. Discuss the QC Plan requirements at the pre-construction, pre-pave, and progress meetings. The QC Plan shall contain at a minimum the following information.

- (a) Key Personnel and contact information.
- (b) Polymeric resin production plants, location of plants, personnel qualifications, inspection and record keeping methods, equipment calibration records, and accreditation certificates.
- (c) Aggregate production plant locations, personnel qualifications, inspection and record keeping methods, equipment calibration records, and accreditation certificates.
- (d) Moisture control methods of aggregate.
- (e) List of manufacturer recommendations for storage of material, weather restrictions, curing time, and opening to traffic.
- (f) Cleaning and maintenance schedule for truck mounted application machine, including metering and monitoring devices.
- (g) Corrective actions that will be taken for unsatisfactory construction practices and deviations from specifications.
- (h) A technical expert representative from the polymeric resin manufacturer shall be present at the construction site to train construction personnel prior to placing the HFST and shall remain on the project for the first two days of paving. After the first two days, the representative shall be available during HFST application as necessary.

The QC Plan shall designate a QC Manager, who shall have full authority to institute any action necessary for the successful operation of the QC Plan. The QC Manager shall be on the jobsite at all times during placement of the HFST.

A field technician shall be present at the job site unless otherwise approved in the QC Plan. The field technician shall be responsible for the required field quality control sampling and testing in conformance with the approved quality control plan and contract documents. All sampling shall be performed in the presence of and in locations as directed by the Engineer. Maintain and make available upon request complete records of sampling, testing, actions taken to correct problems, and quality control inspection results. Any deviation from the approved QC Plan shall be cause for immediate suspension of operations.

Revised 6/3/14

Weather Restrictions. The polymeric resin binder material shall be applied on dry surfaces (including no condensation moisture from construction vehicles in front of binder application), when the ambient temperature is within the following range.

**Minimum Temperature:** The minimum temperature at time of placement shall be 55 °F (13 °C) and rising, unless the polymeric resin manufacturer can provide test data to support installations at lower temperatures.

**Maximum Temperature:** The maximum temperature at time of placement shall be 105 °F (40 °C) or when the anticipated weather conditions or pavement surface temperature would prevent the proper application of the surface treatment in accordance with the manufacturer's recommendations.

Ensure the polymeric resin components are capable of being mixed at lower than ambient temperatures in the event that the components are stored outdoors.

HFST materials shall not be placed when rain is forecast within 24 hours of application.

There shall be no visible moisture present on the surface of the pavement at the time of application of the HFST. A plastic sheet left taped in place for a minimum of two hours, according to ASTM D 4263, shall be used to identify moisture in the pavement.

Preparation. Roadway patching shall be performed in accordance with Section 442 of the Standard Specifications. All inadequately sealed joints and cracks 1/4 to 1-3/4 in. (6 to 43 mm) wide shall be cleaned and filled with a sealant approved by the polymeric resin manufacturer, which will bond to the specified polymeric resin binder. Crack sealing shall be performed in accordance with Section 451 or 452 of the Standard Specifications, except the crack shall be only filled flush with no "band-aid" effect. Where HFST will be applied on either new HMA or new PCC surface or patches in a project, construct HFST a minimum of 30 days after placement of underlying and adjacent pavement. Prepare all HMA and PCC surfaces using shot blasting equipment prior to installation of the HFST. Shot blasting shall completely remove all curing compounds on new PCC surfaces and remove all residues on HMA surfaces.

Remove existing pavement markings in areas to be covered with HFST in accordance with Section 783 of the Standard Specifications. Adequately cover and protect all utilities, preformed joint seal, raised pavement markers, and existing pavement markings (in areas where markings will be left in place) prior to HFST placement.

Shot blast existing HMA and PCC surfaces and clean with a RAS without dust suppression water, or by other methods approved by the QC Manager and the Engineer prior to application of the polymeric resin. Surfaces may need to be washed with a mild detergent, and then rinsed and dried using a hot compressed air lance. Receiving surfaces must be clean, dry and free of all dust, oil, debris and any other material that might interfere with the bond between the polymeric resin binder material and existing surfaces.

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Test Section. Construct a test section (minimum of 200 sq yd (168 sq m)) within the project to demonstrate the truck mounted application machine has been properly calibrated. This test section shall be considered part of the HFST quantity on the project. Correct deficient areas before opening to traffic as directed at no additional cost to the Department. Open the test section to traffic after curing has completed, and no uncovered polymeric resin remains exposed.

HFST Application. The HFST shall be applied according to one of the following methods based on the quantity being placed.

(a) Projects Greater Than or Equal to 300 sq yd (250 sq m). A self-propelled, fully automated truck mounted application machine shall be used for application on projects with total HFST quantities of 300 sq yd (250 sq m) or more.

(1) Binder Application. The binder components shall be mixed proportionally in accordance with the manufacturer's recommended ratio. The polymeric resin binder shall be applied by a truck mounted application machine onto the pavement section to be treated within the temperature range specified. The binder shall be applied in varying widths of up to 12 ft (3.6 m) wide at a uniform application rate of 3.5 sq yd/gal (0.75 sq m/L) with a uniform thickness of 60 mils (1.5 mm) onto the pavement. Do not allow the binder to separate in the mixing lines, cure, dry, chill, set up, or otherwise impair retention bonding of the high friction surfacing aggregate. Ensure that no seams are visible in the middle of the traffic lanes of the finished work after application of the surface aggregate.

(2) Aggregate Application. The aggregate shall be applied by the same truck mounted application machine, which includes an aggregate drop spreader, immediately after placing the polymeric resin binder. The aggregate shall be applied uniformly to ensure complete coverage of the "wet" polymeric resin binder and result in a retained rate of 11-15 lb/sq yd (6-8 kg/sq m). No exposed polymeric resin shall remain visible on the surface.

(b) Projects Less Than 300 sq yd (250 sq m). Manual application may be used on projects with total HFST quantities less than 300 sq yd (250 sq m).

(1) Binder Application. The binder components shall be mixed to the correct proportion within 4 percent by weight using a low speed high torque drill fitted with a helical stirrer. The mixed components shall be applied manually onto the prepared pavement surface using a serrated edged squeegee resulting in a minimum coverage rate of 3.5 sq yd/gal (0.75 sq m/L) with a uniform thickness of 60 mils (1.5 mm).

(2) Aggregate Application. The aggregate shall be sprinkled or dropped vertically without splashing the wet polymeric resin film during placement, whether by mechanical or manual means.

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Sampling and Testing. During the first day of construction, samples of the polymeric resin binder (0.125 gal (0.5 L) of each component) and aggregate (two 40-lb (18-kg) bags) shall be taken from the materials on the jobsite and submitted to the Bureau of Materials and Physical Research. The Contractor shall supply the sample containers, and sample and label the material under the direct observation of the Engineer.

Curing and Clean Up. Allow the treatment to cure in accordance with polymeric resin manufacturer recommendations. Perform three separate clean up processes by removing the excess aggregate with a RAS on the treated area and adjacent areas. Perform initial clean up before opening to traffic. Excess aggregate can be reused on the following day's installation provided the reclaimed aggregate is clean, uncontaminated and dry. Perform secondary clean up 3 to 5 days after construction. Perform final clean up 3 to 5 weeks after construction.

Field Acceptance Testing. Ensure that the coverage rate of the retained aggregate is 11-15 lb/sq yd (6-8 kg/sq m). Remove and re-apply HFST where any patches of exposed polymeric resin exist, at no additional cost to the Department. The HFST treated area will be tested by the Department within 60 days after construction in accordance with the requirements in Table 3. Remove and replace deficient locations as directed.

Table 3 – Field Acceptance Testing Requirements

Property	Requirements	Frequency	Test Method
FN40R (Corrected field FN by adding the correction in Table 4)	72 min.	Every 0.1 mile in each lane. By Department	ASTM E 274 (Ribbed tire)
Field Dynamic Friction Value (20 km/hr) (By IDOT) OPTIONAL	0.90 min.	1 per each location, or 1 per every 1,500 lane-feet, whichever is shorter. By Department	ASTM E 1911
Mean Profile Depth (mm) OPTIONAL	1.0 min.	1 per each location, or 1 per every 1,500 lane-feet, whichever is shorter. By Department	ASTM E 2157

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Table 4 – HFST Speed Correction Factors for ASTM E 274 Testing Using a Ribbed Tire

Test Speed (mph)	FN Correction	Test Speed (mph)	FN Correction	Test Speed (mph)	FN Correction
20	-9.3	30	-4.8	40	0.0
21	-8.9	31	-4.4	41	0.5
22	-8.4	32	-3.9	42	1.0
23	-8.0	33	-3.4	43	1.5
24	-7.6	34	-2.9	44	2.0
25	-7.1	35	-2.5	45	2.5
26	-6.7	36	-2.0	46	3.1
27	-6.2	37	-1.5	47	3.6
28	-5.8	38	-1.0	48	4.1
29	-5.3	39	-0.5	49	4.6

Method of Measurement. High Friction Surface Treatment will be measured for payment in square yards (sq m). The width for measurement will be the width of the top surface as shown on the plans or directed by the Engineer.

Patches will be measured for payment according to Article 442.10 of the Standard Specifications.

Pavement marking removal will be measured for payment according to Article 783.05 of the Standard Specifications.

Crack/joint sealing will be measured for payment according to Article 451.05 or 452.05 of the Standard Specifications.

Basis of Payment. High Friction Surface Treatment will be paid for at the contract unit price per square yard (square meter) for HIGH FRICTION SURFACE TREATMENT.

Patches will be paid for according to Article 442.11 of the Standard Specifications.

Pavement marking removal will be measured for payment according to Article 783.06 of the Standard Specifications.

Crack/joint sealing will be paid for according to Article 451.06 or 452.06 of the Standard Specifications.

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